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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/939,134	08/24/2001	Charles K. Sestok IV	TI-32545	2975

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EXAMINER	
FILE, ERIN M	

ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/939,134	SESTOK ET AL.	
	Examiner	Art Unit	
	Erin M. File	2634	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *5* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,9 and 13-16* is/are rejected.

7)☒ Claim(s) *7,8 and 10-12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Arguments

1. Applicant's arguments filed 2/18/2005 have been fully considered but they are not persuasive.

Applicants Argument

Applicants respectfully point to the Examiner that claim 1 recites that the mean-squared error minimization is constrained according to a weighted spectral flatness term. Neither of the cited references teaches this limitation. Thus, neither of the cited references individually or in combination teach constraining the mean-squared error minimization according to a weighted spectral flatness term as recited in claim 1.

Examiner's Response

According to the applicant Fertner, as well as the other cited references, fail to teach a mean-squared error minimization constrained according to a weighted spectral flatness term. Fertner discloses a constant γ that is defined by the following equation.

$$y_n = \gamma \cdot s_{n-n_0}$$

Equation 1

Where y_n is the equalized symbol, and s_n is the transmitted signal and therefore s_{n-no} is the transmitted signal compensated for the delay introduced in the transmission channel. Spectral Flatness is a spatial correlation between the actual signal shape and the theoretical signal shape. A weighted spectral flatness term is not further defined by the applicant, so that the term γ can be interpreted as a weighted spectral flatness term, as it is a weighting term that must obey the constraints of equation 1, where equation 1

relates the actual (transmitted) signal and the theoretical (equalized) signal. Fertner expresses in equation 31 (col. 10, line 62) that the cost function $J(n'_o)$ is equivalent to the minimum mean squared error. The minimum mean squared error can be said to be constrained, or dependent, upon γ, according to the equation 21 (col. 9, line 58).

$$J(n'_0)=\{(TEQ_n \otimes h_n)-\gamma\cdot\delta(n-n'_0)\}^2$$

Response to Amendment

2. The amendments filed on 2/18/2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the originally cited references.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4, 6, 9, 13-16 are rejected under U.S.C. 103(a) as being unpatentable over Mukherjee in view of Fertner.

Claims 1, 13, Mukherjee discloses a digital transceiver (fig 2) comprising:

- analog circuitry coupled to a communications facility, for transmitting and receiving analog signals in the time-domain over a transmission channel (26R)
- a coder (20R) / decoder (40R) coupled to said analog circuitry
- a time-domain equalizer process, including a conventional finite impulse response (FIR) filter
- a Fast Fourier Transform to recover the symbols from the subchannels (33R)
- a frequency domain equalizer to the output of the Fourier transform to remove frequency response corresponding to the response of the transmission channel from the signal (35R)

Mukherjee does not disclose the coefficients derived according to a mean-squared error minimization constrained according to a spectral flatness, however Fertner discloses the coefficients of the digital filter of the time-domain equalizer (fig 3, 53) are selected by minimizing negative effects of interference with a mean squared error (MSE) term (col. 5, lines 58-62). Further, Fertner discloses the minimum mean squared error term is constrained by a weighted spectral flatness term. Although Mukherjee's transceiver does not choose coefficients according to a mean squared error term, Mukherjee does choose the coefficients of the equalizer according to the response of the transmission channel (col. 8, lines 33-35). Further, Fertner discloses that the use of the minimum mean squared error to choose the equalizer coefficients minimizes the inter-symbol interference (col. 6, lines 11-14). Because of this advantage in choosing coefficient terms it would be obvious to one of ordinary skill in the art at the time of invention to

incorporate the use of mean squared error as disclosed by Fertner for choosing coefficients in Mukherjee's apparatus.

Claim 2 inherits the limitations of Claim 1, further Mukherjee discloses a conventional finite impulse response (FIR) filter that is implemented by way of a software routine performed by a digital signal processor (DSP) (col. 8, line 33).

Claim 3, inherits limitations of Claim 1. In his transceiver Mukherjee further discloses a process which adds a circular prefix to the bitstream (24R) and also a process (32R) to eliminate the circular prefixes to interframe portions of the data sequence before the data enters the Fourier Transform (33R).

Claim 4, inherits all of the limitations of Claim 1. Further Mukjerhee teaches an analog front end (AFE 12) which includes filters (column 11, lines 36, 37).

Claim 6, Fertner discloses a training mode in which equalizer filter coefficients processor (fig 3, 53) calculates optimal timing equalizer coefficient vectors. Coefficients are chosen to minimize negative effects of interference from adjacent symbols based on minimizing the mean-squared error. The use of the mean square error minimization is discussed in the above paragraph. The use of a training mode is well known in the art because it allows an equalizer to quickly calculate coefficients that will best compensate for noise and interference. These common techniques would make it obvious at the

time of invention to one of ordinary skill in the art to incorporate Fertner's training mode into Mukjerhee's apparatus.

Claim 9, Mukherjee discloses a digital transceiver including analog front end receiving components for recovering digital signal components (abstract) comprising:

- analog-to-digital converter (48C, 48R)
- a time-domain equalizer process, including a conventional finite impulse response (FIR) filter
- a Fast Fourier Transform to recover the symbols from the subchannels (33R)
- a frequency domain equalizer to the output of the Fourier transform to remove frequency response corresponding to the response of the transmission channel from the signal (35R)

Mukherjee does not explicitly disclose that the analog signals correspond to a plurality of frequency subbands, however, as the data is found in frequency subchannels when converted to the frequency domain, it is implied that the analog signals corresponded to a plurality of frequency subbands. Mukherjee also fails to disclose the coefficients derived according to a mean-squared error minimization constrained according to a spectral flatness, however Fertner discloses the coefficients of the digital filter of the time-domain equalizer (fig 3, 53) are selected by minimizing negative effects of interference with a mean squared error (MSE) term (col. 5, lines 58-62). Further, Fertner discloses the minimum mean squared error term is constrained by a weighted

spectral flatness term. Although Mukherjee's transceiver does not choose coefficients according to a mean squared error term, Mukherjee does choose the coefficients of the equalizer according to the response of the transmission channel (col. 8, lines 33-35). Further, Fertner discloses that the use of the minimum mean squared error to choose the equalizer coefficients minimizes the inter-symbol interference (col. 6, lines 11-14). Because of this advantage in choosing coefficient terms it would be obvious to one of ordinary skill in the art at the time of invention to incorporate the use of mean squared error as disclosed by Fertner for choosing coefficients in Mukherjee's apparatus.

Claim 14 inherits the limitations of Claim 13. Mukherjee further discloses a process in his transceiver which adds a circular prefix to the bitstream (24R) and also a process (32R) to eliminate the circular prefixes to interframe portions of the data sequence before the data enters the Fourier Transform.

Claim 15, inherits the limitations of Claim 13. Further Fertner discloses a training mode in which equalizer filter coefficients processor (53) calculates optimal timing equalizer coefficient vectors. Coefficients are chosen to minimize negative effects of interference from adjacent symbols based on minimizing the mean-squared error as explained in Claim 1.

Claim 16, inherits the limitations of Claim 13, further Mukherjee discloses a conventional finite impulse response (FIR) filter that is implemented by way of a software routine performed by a digital signal processor (DSP) (col. 8, lines 30-34).

Claim Objections

5. **Claims 7, 8, 10-12** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin M. File whose telephone number is (571)272-6040.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571)272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Erin File

EF

3.29.2005

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